REMARKS

This Amendment responds to the Office Action dated October 4, 2004 in which the Examiner objected to the drawings, rejected claims 1-3, 5-6, 8-9 and 11 under 35 U.S.C. §102(e) and rejected claims 4, 7, 10 and 12-14 under 35 U.S.C. §103.

Attached to this Amendment are replacement sheets for Figures 1 and 2 which have been labeled prior art. Applicants respectfully request the Examiner approves the correction and withdraws the objection to the drawings.

Claim 1 claims a magnetoresistive effect thin-film magnetic head, comprising a lower shield layer, a lower gap layer, a magnetoresistive effect multilayer, an upper gap layer, an insulation gap layer, an upper shield layer and an additional insulation layer. The lower gap layer is made of a nonmagnetic electrically conductive material and is laminated on the lower shield layer. The magnetoresistive effect multilayer has a current flow in a direction perpendicular to surfaces of layers of the magnetoresistive effect multilayer. The magnetoresistive effect multilayer is laminated on the lower gap layer. The upper gap layer is made of a nonmagnetic electrically conductive material and is laminated on the magnetoresistive effect multilayer. The insulation gap layer is made of an insulation material and is formed at least between the lower shield layer and the upper gap layer. The upper shield layer is laminated on the upper gap layer and the insulation gap layer. The additional insulation layer is formed so that a distance between the lower shield layer and the upper gap layer increases at a location where the magnetoresistive effect multilayer is absent.

Through the structure of the claimed invention having an insulation gap layer which surrounds a lower gap layer and a magnetoresistive effect multilayer, as claimed in claim 1, the claimed invention provides a magnetoresistive effect thin film magnetic head having improved frequency characteristics. The prior art does not show, teach or suggest the invention as claimed in claim 1.

Claim 6 claims a manufacturing method of a magnetoresistive effect thin-film magnetic head provided with a magnetoresistive effect multilayer in which a current flows in a direction perpendicular to surfaces of layers of the magnetoresistive effect multilayer. The method comprising the steps of, first, forming a lower shield layer. A recess is then formed in a part of the lower shield layer at a position where the magnetoresistive effect multilayer is to be absent. An additional insulation layer is formed in the recess. A lower gap layer of a nonmagnetic electrically conductive material is formed on the lower shield layer at a position where the magnetoresistive effect multilayer is to be formed. The magnetoresistive effect multilayer is formed on the lower gap layer. An insulation gap layer of an insulation material is formed at least on the additional insulation layer to surround the lower gap layer and the magnetoresistive effect multilayer. An upper gap layer of a nonmagnetic electrically conductive material is formed on the magnetoresistive effect multilayer and the insulation gap layer. An upper shield layer is formed on the upper gap layer.

Through the method of the claimed invention a) forming an insulation gap layer on an additional insulation layer to surround a lower gap layer and magnetoresistive effect multilayer and b) forming an upper gap layer on the magnetoresistive effect multilayer and the insulation gap layer as claimed in claim 6, the claimed invention provides a method of manufacturing a magnetoresistive effect

thin film magnetic head with improved frequency characteristics. The prior art does not show, teach or suggest the invention as claimed in claim 6.

Claim 9 claims a manufacturing method of a magnetoresistive effect thin-film magnetic head provided with a magnetoresistive effect multilayer in which a current flows in a direction perpendicular to surfaces of layers of the magnetoresistive effect multilayer. The method comprising the steps of; first, forming a lower shield layer. A lower gap layer of a nonmagnetic electrically conductive material is then formed on the lower shield layer at a position where the magnetoresistive effect multilayer is to be formed. The magnetoresistive effect multilayer is formed on the lower gap layer. An insulation gap layer of an insulation material is formed on the lower shield layer to surround the lower gap layer and the magnetoresistive effect multilayer. An additional insulation layer is formed on the insulation gap layer at a position where the magnetoresistive effect multilayer is absent. An upper gap layer of a nonmagnetic electrically conductive material is formed on the magnetoresistive effect multilayer and the additional insulation layer. An upper shield layer is formed on the upper gap layer.

Through the method of the claimed invention a) forming an insulation gap layer on a lower shield layer to surround a lower gap layer and a magnetoresistive effect multilayer and b) forming an addition insulation layer on the insulation gap layer at a position where the magnetoresistive effect multilayer is absent, as claimed in claim 9, the claimed invention provides a method of manufacturing a magnetoresistive effect thin-film magnetic head with improved frequency characteristics. The prior art does not show, teach or suggest the invention as claimed in claim 9.

Claim 12 claims a manufacturing method of a magnetoresistive effect thin-film magnetic head provided with a magnetoresistive effect multilayer in which a current flows in a direction perpendicular to surfaces of layers of the magnetoresistive effect multilayer. The method comprising the steps of; first, forming a lower shield layer. Next, a recess is formed in a part of the lower shield layer at a position where the magnetoresistive effect multilayer is to be absent. A first additional insulation layer is formed in the recess. A lower gap layer of a nonmagnetic electrically conductive material is formed on the lower shield layer at a position where the magnetoresistive effect multilayer is to be formed. The magnetoresistive effect multilayer is formed on the lower gap layer. An insulation gap layer of an insulation material is formed at least on the first additional insulation layer to surround the lower gap layer and the magnetoresistive effect multilayer. A second additional insulation layer is formed on the insulation gap layer at a position where the magnetoresistive effect multilayer is absent. An upper gap layer of a nonmagnetic electrically conductive material is formed on the magnetoresistive effect multilayer and the second additional insulation layer. An upper shield layer is formed on the upper gap layer.

Through the method of the claimed invention a) forming an insulation gap layer at least on a first additional insulation layer to surround a lower gap layer and a magnetoresistive effect multilayer and b) forming a second additional insulation layer on the insulation gap layer at a position where the magnetoresistive effect multilayer is absent, as claimed in claim 12, the claim invention provides a method of manufacturing a magnetoresistive effect thin-film magnetic head with improved frequency characteristics. The prior art does not show, teach or suggest the invention as claimed in claim 12.

As indicated above, claim 1 has been amended to make explicit what is implicit in the claim and to correct a translational error. Applicants respectfully submit that the amendment is unrelated to a statutory requirement for patentability and does not narrow the literal scope of the claim.

Claims 1-3, 5-6, 8-9 and 11 were rejected under 35 U.S.C. §102(e) as being anticipated by *Sato* (U.S. Patent No. 6,563,678).

Applicants respectfully traverse the Examiner's rejection of the claims under 35 U.S.C. §102(e). The claims have been reviewed in light of the Office Action, and for reasons which will be set forth below, Applicants respectfully request the Examiner withdraws the rejection to the claims and allows the claims to issue.

Sato appears to disclose a thin-film magnetic head giving an improved electrical insulation between the electrode layer of the, magnetoresistive effect element and the lower shielding layer, and a manufacturing method thereof. (col. 1 lines 12-15) As shown in FIG. 2, a lower gap layer 21 made of a non-magnetic material such as Al.sub.2 O.sub.3 (alumina) is provided on the lower shielding layer 20. A magnetoresistive effect element 22 is formed on the lower gap layer 21. A multilayer film 23 displaying magnetoresistive effect is formed at the center of the magnetoresistive effect element 22. The multilayer film 23 is, for example a GMR element using giant magnetoresistive effect typically represented by a spin-valve film or an AMR element using anisotropic magnetoresistive effect. (col. 6, lines 58-67) A hard bias layer 24 and an electrode layer 25 (Cr (chromium) or Ta (tantalum)) are formed on each of the both sides of the multilayer film 23. (col. 7, lines 6-8) The upper gap layer 26 made of Al_2O_3 (alumina) is formed on the multilayer film 23 and the electrode layer 25, and further, an upper shielding layer 27 is formed on the

upper gap layer 26. (col. 7, lines 26-29) An insulating layer 40 is formed, in addition to the upper gap layer 26, between the electrode layer 25 and the upper shielding layer 27. In FIG. 5, the insulating layer 40 is formed directly on the upper surface of the electrode layer 25. In FIG. 5, the entire upper surface of the electrode layer 25 is completely covered with the insulating layer 40. The insulating layer 40 may be made of any insulating material including, for example, Al_2O_3 (alumina) used conventionally as an insulating material. (col. 10, lines 52-65) In the embodiment shown in FIG. 5, as described above, the insulating layer 40 is formed between the electrode layer 25 and the upper shielding layer 27, thus making it possible to keep a satisfactory electrical insulation between the electrode layer 25 and the upper shielding layer 27. While in FIG. 5, the recess 20a is formed in the lower shielding layer 20, and the insulating layer 29 is formed in this recess 20a, an insulating layer 28 having a slant 28a may be formed on the lower shielding layer 20. It is not always necessary to form the insulating layer 29 between the lower shielding layer 20 and the electrode layer 25. (col. 11, lines 7-17)

Thus, *Sato* merely discloses an insulating layer 40 formed between an electrode layer 25 and an upper shielding layer 27. Nothing in *Sato* shows, teaches or suggests an insulation gap layer which surrounds a lower gap layer and a magnetoresistive effect multilayer as claimed in claims 1, 6 and 9 (and 12). Rather, *Sato* merely discloses an insulating layer 40 which is formed between an electrode layer 25 and an upper shielding layer 27.

Additionally, *Sato* merely discloses a recess 20A formed in a lower shielding layer 20, an insulating layer 29 formed in the recess 20A and a lower gap layer 21 formed thereon. Thus, nothing in *Sato* shows, teaches or suggests forming an

insulation gap layer at least on an additional insulation layer which is formed in a recess in part of a lower shield layer as claimed in claim 6 (and claim 12). Rather, *Sato* merely discloses that the lower gap layer 21 is formed on the insulating layer 29 which is formed in the recess 20A.

Furthermore, *Sato* merely discloses that the upper gap layer 26 is formed on the insulation layer 40. Nothing in *Sato* shows, teaches or suggests forming an additional insulation layer on the insulation gap layer at a position where the magnetoresistive effect multilayer is absent as claimed in claim 9 (and claim 12). Rather, *Sato* merely discloses forming the upper gap layer 26 on the insulating layer 40.

Since nothing in *Sato* shows, teaches or suggests the features as claimed above in claims 1, 6 and 9, Applicants respectfully request the Examiner withdraws the rejection to claims 1, 6 and 9 under 35 U.S.C. §102(e).

Claims 2-3, 5, 8 and 11 depend from claims 1, 6 and 9 and recite additional features. Applicants respectfully submit that claims 2-3, 5, 8 and 11 would not have been anticipated by *Sato* within the meaning of 35 U.S.C. §102(e) at least for the reasons as set forth above. Therefore, Applicants respectfully request the Examiner withdraws the rejection to claims 2-3, 5, 8 and 11 under 35 U.S.C. §102(e).

Claims 4, 7 and 10 were rejected under 35 U.S.C. §103 as being unpatentable over *Sato* and further in view of *Redon et al.* (U.S. Patent No. 6,381,107).

Applicants respectfully traverse the Examiner's rejection of the claims under 35 U.S.C. §103. The claims have been reviewed in light of the Office Action, and for

reasons which will be set forth below, Applicants respectfully request the Examiner withdraws the rejection to the claim and allows the claims to issue.

As discussed above, since nothing in *Sato* shows, teaches or suggests the primary features as claimed in claims 1, 6 and 9, Applicants respectfully submit that the combination of the primary reference of *Sato* with the secondary reference to *Redon et al.* will not overcome the deficiencies of the primary reference. Therefore, Applicants respectfully request the Examiner withdraws the rejection to claims 4, 7 and 10 under 35 U.S.C. §103.

Claims 12 and 14 were rejected under 35 U.S.C. §103 as being unpatentable over *Sato* in view of *Fontanna et al.* (U.S. Patent No. 5,568,335).

Applicants respectfully traverse the Examiner's rejection of the claims under 35 U.S.C. §103. The claims have been reviewed in light of the Office Action and for reasons which will be set forth below, Applicants respectfully request the Examiner withdraws the rejection to the claims and allows the claims to issue.

As discussed above, *Sato et al.* merely discloses an insulating layer 40 formed between an electrode layer 25 and an upper gap layer 26. Nothing in *Sato et al.* shows, teaches or suggests a) forming an insulating gap layer to surround a lower gap layer and a magnetoresistive effect multilayer, b) forming the insulative gap layer on a first additional insulation layer which is formed in a recess and c) forming a second additional insulating layer at a position where the magnetoresistive effect multilayer is absent as claimed in claim 12. Rather, *Sato* merely discloses forming an insulating layer 40 between an electrode layer 25 and an upper gap layer 26.

Fontanna et al. appears to disclose a narrow gap magnetoresistive (MR) read head and more particularly to an MR read head where gap layers are narrow in an

MR sensor region adjacent an air bearing surface (ABS) to provide good resolution and thicker outside of the MR sensor region to provide good insulation between lead layers and first and second shield layers. (col. 1, lines 17-23) A method of constructing a narrow gap read head will not short between lead layers and shield layers and has a more planar MR region. This is accomplished by a two step process of depositing first gap layers before the MR sensor is deposited and a two step process of depositing second gap layers after the MR sensor is deposited. In the invention a very thin first gap layer G1 is deposited on the first shield layer S1. An MR region is then masked and a first gap pre-fill layer G1P, which may be thicker than G1, is deposited. The mask is removed, leaving the first gap pre-fill layer G1P everywhere except in the MR region. Lead layers L1 and L2 and an MR sensor are formed. In one embodiment planarization is enhanced in the MR region so that a high resolution second pole tip of a write head can be constructed. Next, a very thin second gap layer G2 is deposited. The MR region is then masked and a second gap pre-fill layer G2P is deposited. After lifting off the mask, the G2P layer is located everywhere except in the MR region. The result is that very thin G1 and G2 layers are in the MR region at the bottom and top of the MR sensor to provide the MR head with a high linear resolution, the G1 and G1P layers are located between the leads and the first shield layer S1 to prevent shorting between the lead layers and the first shield layer S1, and the G2 and G2P layers are located between the lead layers and the second shield layer S2 to prevent shorting between the lead layers and the second shield layer S2. (col. 2, line 53 through col. 3, line 14)

Thus, *Fontanna et al.* merely discloses gap layers G1, G1P located between the leads and first shield layer S1 to prevent shorting between lead layers and first

shield layer S1 and gap layers G2 an G2P located between the lead layers and the second shield layer S2 to prevent shorting between the lead layers and the second shield layer S2. Nothing in *Fontanna* shows, teaches or suggests (a) forming an insulation gap layer on a first additional insulation layer which is formed in a recess, (b) forming the insulation gap layer to surround a lower gap layer and a magnetoresistive effect multiplayer as claimed in claim 12. Rather, *Fontanna et al.* merely discloses gap layers G1, G1P, G2 and G2P which are provided between lead layers and shield layers S1, S2.

Since nothing in *Sato* or *Fontanna et al.* show, teach or suggest the primary features as claimed in claim 12, Applicants respectfully request the Examiner withdraws the rejection to claim 12 under 35 U.S.C. §103.

Claim 14 depends from claim 12 and recites additional features. Applicants respectfully submit that claim 14 would not have been obvious within the meaning of 35 U.S.C. §103 over *Sato* and *Fontanna et al.* at least for the reasons as set forth above. Therefore, Applicants respectfully request the Examiner withdraws the rejection to claim 14 under 35 U.S.C. §103.

Claim 13 was rejected under 35 U.S.C. §103 as being unpatentable over *Sato* and *Fontanna et al.* and further in view of *Redon et al.*

Applicants respectfully traverse the Examiner's rejection of the claims under 35 U.S.C. §103. The claim has been reviewed in light of the Office Action, and for reasons which will be set forth below, Applicant respectfully requests the Examiner withdraws the rejection to the claim and allows the claim to issue.

As discussed above, since nothing in the combination of the primary references to *Sato* and *Fontanna et al.* show, teach or suggest the primary features

as claimed in claim 12, Applicants respectfully submit that the combination of the secondary reference to *Redon et al.* will not overcome the deficiencies of the primary reference. Therefore, Applicants respectfully request the Examiner withdraws the rejection to claim 13 under 35 U.S.C. §103.

The prior art of record, which is not relied upon, is acknowledged. The references taken singularly or in combination to don anticipate or make obvious the claimed invention.

Thus is now appears that the application is in condition for reconsideration and allowance. Reconsideration and allowance at an early date are respectfully requested.

If for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is requested to contact, by telephone, the Applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed within the currently set shortened statutory period, Applicants respectfully petition for an appropriate extension of time. The fees for such extension of time may be charged to our Deposit Account No. 02-4800.

In the event that any additional fees are due with this paper, please charge our Deposit Account No. 02-4800.

Respectfully submitted,

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